MEDICAL DEVICES FOR MAPPING CARDIAC TISSUE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119 to U.S. Provisional Application Ser. No. 61/991,288, filed May 9, 2014, the entirety of which is incorporated herein by reference.

TECHNICAL FIELD

The present disclosure pertains to medical devices, and methods for manufacturing medical devices. More particularly, the present disclosure pertains to medical devices and methods for mapping and/or ablating cardiac tissue.

BACKGROUND

A wide variety of intracorporeal medical devices have been developed for medical use, for example, intravascular use. Some of these devices include guidewires, catheters, and the like. These devices are manufactured by any one of a variety of different manufacturing methods and may be used according to any one of a variety of methods. Of the known medical devices and methods, each has certain advantages and disadvantages. There is an ongoing need to provide alternative medical devices as well as alternative methods for manufacturing and using medical devices.

BRIEF SUMMARY

This disclosure provides design, material, manufacturing method, and use alternatives for medical devices.

In a first example a system for mapping the electrical activity of the heart is disclosed. The system includes a processor. The processor can sense a plurality of signals with a plurality of electrodes positioned within the heart and generate, based at least in part on the sensed plurality of signals, an alternate signal for each one of the plurality of signals. Each alternate signal can correspond to one of the plurality of signals and the alternate signal for each one of the plurality of signals includes determining a dominant frequency for the plurality of signals. The processer can also determine a fiducial point on each alternate signal and determine, based at least in part on each determined fiducial point, an activation time in each corresponding one of the plurality of signals.

In addition or alternatively, and in another example determining, based at least in part on each determined fiducial point, an activation time in each corresponding one of the plurality of signals includes determining a timing associated with each fiducial point as the activation time for each corresponding one of the plurality of signals.

In addition or alternatively to any one or more of the above, and in another example determining, based at least in part on each determined fiducial point, an activation time in each corresponding one of the plurality of signals includes identifying, based at least in part on a timing associated with each fiducial point, a window in each corresponding one of the plurality of signals and for each of the plurality of signals, determining an activation time within the identified window.

In addition or alternatively to any one or more of the above, and in another example determining an activation time within the identified window includes determining the timing of the maximum negative derivative in the identified window as the activation time for each of the plurality of signals.

In addition or alternatively to any one or more of the above, and in another example determining an activation time within the identified window includes determining the timing of a zero-crossing in the identified window as the activation time for each of the plurality of signals.

In addition or alternatively to any one or more of the above, and in another example the system includes if no zero-crossing occurs within an identified window, determining the timing associated with the fiducial point as the activation time for the corresponding one of the plurality of signals.

In addition or alternatively to any one or more of the above, and in another example the system includes that a width of the window is user defined.

In addition or alternatively to any one or more of the above, and in another example generating, based at least in part on the sensed plurality of signals, an alternate signal for each one of the plurality of signals includes determining a dominant frequency for the plurality of signals, determining a phase for each of the plurality of signals at the dominant frequency and generating an alternate signal corresponding to one of the plurality of signals for each of the plurality of signals Further, each generated alternate signal has the same phase as the corresponding one of the plurality of signals.

In addition or alternatively to any one or more of the above, and in another example determining a dominant frequency for the plurality of signals includes processing each of the plurality of signals using a Fourier Transform, generating a composite signal based on the processed plurality of signals and determining the frequency with the greatest power in the composite signal.

In addition or alternatively to any one or more of the above, and in another example generating a composite signal based on the processed plurality of signals includes determining the median value of all of the plurality of signals at each frequency, determining the mean value of all of the plurality of signals at each frequency, or determining the mode value of all of the plurality of signals at each frequency.

In addition or alternatively to any one or more of the above, and in another example each alternate signal is a sinusoid.

In addition or alternatively to any one or more of the above, and in another example the activation time is displayed on a display.

In addition or alternatively to any one or more of the above, and in another example an activation time is displayed on a static activation map, a dynamic map, or both.

In addition or alternatively to any one or more of the above, and in another example displaying an activation map includes displaying one or more phase values of one or more alternate signals.

In addition or alternatively to any one or more of the above, and in another example determining, based at least in part on each determined fiducial point, an activation time in each corresponding one of the plurality of signals includes utilizing a probability function to determine the activation time.

In addition or alternatively to any one or more of the above, and in another example a method of identifying an activation time in a cardiac electrical signal is disclosed. The method includes sensing a cardiac electrical signal, generating an approximation signal based at least in part on one or more parameters of the cardiac electrical signal, identifying a fiducial point on the approximation signal and determining, based at least in part on a timing of the fiducial point in the approximation signal, an activation time in the cardiac electrical signal.

In addition or alternatively to any one or more of the above, and in another example one or more parameters of the cardiac signal include a dominant frequency.